

WHAT IS CLAIMED:

1. A balloon catheter comprising a distally-located inflatable balloon comprising an energy-conductive hydrophilic polymer having a tensile strength of at least 3000 psi, wherein the balloon is molded to inflate to specified equilibrium dimensions when subjected to about one atmosphere of internal pressure.
2. The balloon catheter of claim 1, wherein the hydrophilic polymer further has an elasticity that permits the balloon to inflate to dimensions greater than its equilibrium dimensions under more than one atmosphere of internal pressure without failing.
3. The balloon catheter of claim 2, wherein the balloon can be inflated to dimensions at least 50% greater than its equilibrium dimensions.
4. The balloon catheter of any one of claims 1, 2 or 3, wherein the hydrophilic polymer, when hydrated, comprises from 10 volume percent to about 40 volume percent water.
5. The balloon catheter of claim 4, wherein the hydrophilic polymer, when hydrated, comprises about 20% volume percent water.
6. The balloon catheter of either claim 1, wherein the hydrophilic polymer comprises a conductive homopolymeric or co-polymeric thermoplastic polyurethane when hydrated with an electrolytic solution.
7. The balloon catheter of claim 6, wherein the thermoplastic polyurethane is TECOPHILIC®.

8. The balloon catheter of claim 1, further comprising a non-conductive polymer mask adhered to a surface of the balloon to create a pattern of conductive and non-conductive areas wherein the non-conductive polymer has physical and chemical characteristics compatible with those of the hydrophilic polymer.

9. The balloon catheter of claim 8, wherein the non-conductive polymer comprises a non-conductive homopolymeric or co-polymeric thermoplastic polyurethane.

10. The balloon catheter of claim 9, wherein the non-conductive polyurethane is TECOFLEX®.

11. The balloon catheter of claim 8 wherein the non-conductive polymer is NeoRez 967®.

12. The balloon catheter of claim 1, wherein the conductive areas of the balloon have a wall thickness of from about 0.0005" to about 0.005".

13. A balloon catheter, wherein, when the balloon is inflated under about one atmosphere of pressure or over-inflated with greater than one atmosphere of pressure, it comprises:

a generally elongate member having a proximal end, a distal end, a first diameter at or near the proximal end, a second diameter at or near the distal end and a third diameter located between the first and second diameters, wherein:

the first and second diameters may be the same or different;

the third diameter is less than both the first and second diameters;

the first diameter is coupled to the third diameter by a distal-facing sloping surface; and,

the second diameter is coupled to the third diameter by a proximal-facing sloping surface.

14. The balloon catheter of claim 13, wherein the second diameter is less than the first diameter.

15. The balloon catheter of claim 13, wherein the distal-facing sloping surface comprises a therapeutic element.

16. The balloon catheter of claim 15, wherein the therapeutic element is selected from the group consisting of an RF energy transmitting element, a microwave energy transmitting element, an ultrasound energy transmitting element, a laser light transmitting element, a drug delivery element, a radiation delivery element, a cryogenic element and a cutting element.

17. The balloon catheter of claim 13, wherein the balloon comprises a an energy-conductive hydrophilic polymer having a tensile strength of at least 3000 psi.

18. The balloon catheter of claim 17, wherein the hydrophilic polymer, when hydrated, comprises from 10 volume percent to about 40 volume percent water.

19. The balloon catheter of claim 18, wherein the hydrophilic polymer, when hydrated, comprises about 20% volume percent water.

20. The balloon catheter of claim 17, wherein the hydrophilic polymer comprises a conductive homopolymeric or co-polymeric thermoplastic polyurethane when hydrated with an electrolytic solution.

21. The balloon catheter of claim 20, wherein the thermoplastic polyurethane is TECOPHILIC®.

22. The balloon catheter of claim 12, further comprising a non-conductive polymer mask adhered to the distal-facing surface of the balloon to create a pattern of conductive and non-conductive areas wherein the non-conductive polymer has physical characteristics compatible with those of the hydrophilic polymer.

23. The balloon catheter of claim 22, wherein the non-conductive polymer comprises a non-conductive homopolymeric or co-polymeric thermoplastic polyurethane.

24. The balloon catheter of claim 23, wherein the non-conductive polyurethane is TECOFLEX®.

25. The balloon catheter of claim 22, wherein the non-conductive polymer is NeoRez 967®.

26. The balloon catheter of claim 22, wherein the conductive areas of the balloon have a wall thickness of from about 0.0005" to about 0.005".

27. The balloon catheter of either claim 8 or claim 22, comprising an ablation balloon catheter.

28. The balloon catheter of claim 27, wherein the energy conducted is RF energy.

29. An electrode assembly, comprising:
an elongate member;

an inflatable member secured to the elongate member, the inflatable member having a proximal end, a distal end, a lumen extending therebetween, and a conductive region; and

an electrode carried by the elongate member, the electrode located within the lumen of the inflatable member and proximal to the conductive region of the inflatable member.

30. The electrode assembly of claim 29, wherein the inflatable member comprises an energy-conductive hydrophilic polymer having a tensile strength of at least 3000 psi.

31. The electrode assembly of claim 29, wherein the inflatable member is molded to inflate to specified equilibrium dimensions when subjected to about one atmosphere of internal pressure.

32. The electrode assembly of claim 29, further comprising a non-conductive polymer mask adhered to a surface of the inflatable member to create a pattern of non-conductive area wherein the non-conductive polymer has physical and chemical characteristics compatible with those of the hydrophilic polymer.